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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/928,523	08/13/2001	Tomohiko Shibata	782_181	8032

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EXAMINER

SONG, MATTHEW J

ART UNIT	PAPER NUMBER
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1765

DATE MAILED: 05/30/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/928,523

Applicant(s)

SHIBATA ET AL.

Examiner

Matthew J Song

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) 14-18 is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-13 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) ____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: ____.

DETAILED ACTION

Election/Restrictions

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:

- I. Claims 1-13, drawn to an apparatus, classified in class 118, subclass 715.
- II. Claims 14-18, drawn to a method, classified in class 117, subclass 84.

2. The inventions are distinct, each from the other because of the following reasons:

Inventions I and II are related as process and apparatus for its practice. The inventions are distinct if it can be shown that either: (1) the process as claimed can be practiced by another materially different apparatus or by hand, or (2) the apparatus as claimed can be used to practice another and materially different process. (MPEP § 806.05(e)). In this case the apparatus as claimed can be used in another and materially different process, such as a process where a metallic gallium is charged upstream.

3. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

4. During a telephone conversation with Steven Burr on 5/13/2003 a provisional election was made with traverse to prosecute the invention of Group I, claims 1-13. Affirmation of this election must be made by applicant in replying to this Office action. Claims 14-18 are

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withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

5. Claims 14-18 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected invention, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in Paper No. 4.

Claim Rejections - 35 USC § 112

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7. Claims 1-7 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 1 is directed to an apparatus however also contains method steps, which is held to be ambiguous, note MPEP 2173.05 (p). Claim 1 is directed to an apparatus and also contains the method limitations of "a III-V nitride film including at least Al is epitaxially grown by using Hydride Vapor Phase Epitaxy....", in lines 6-10.

8. Claims 9-10 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 9 is directed to an apparatus however also contains method steps, which is held to be ambiguous, note MPEP 2173.05 (p). Claim 9 is directed to an apparatus and also

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contains the method limitations of "a given pressure difference is generated in between the inner reactor and the outer reactor" in lines 1-2, likewise for claim 10.

9. Claim 11 rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 11 is directed to an apparatus however also contains method steps, which is held to be ambiguous, note MPEP 2173.05 (p). Claim 11 is directed to an apparatus and also contains the method limitations of "sensor detects at least one selected from the group consisting of an ammonia gas, a hydrogen chloride gas and an inert gas" in lines 2-3.

Claim Rejections - 35 USC § 101

10. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

11. Claims 1-7 and 9-11 are rejected under 35 U.S.C. 101 because the claims are directed to neither a process or an apparatus, but rather overlaps two different statutory classes of invention set forth in 35 U.S.C 101 which is drafted so as to set forth the statutory classes of invention in the alternative only.

Claim Rejections - 35 USC § 103

12. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

13. Claims 1-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vaudo et al (US 6,533,874) in view of Razeghi (US 5,599,732).

Vaudo et al discloses an apparatus for growing a (Ga,Al,In) nitride on a substrate using Hydride vapor phase epitaxy (HVPE) (Abstract). Vaudo et al discloses the HVPE reactor **52** is provided with feed ports **72, 74, 76** and **78**, HCl is introduced to the reactor in feed ports **72, 76',** and **78'** (col 10, ln 1-67) and a substrate **56**. Vaudo et al also teaches feed port **74** accommodates the introduction of ammonia or other nitrogen species into the reactor in the direction and a vessel **67** of molten aluminum is provided in gas flow communication with feed port **76** (col 11, ln 1-40). Vaudo et al also teaches the growth of Al-containing nitride compounds such as AlN and AlGa₃N is complicated and to circumvent problems the entire growth reactor and or reactor liner which are employed should be constructed of alternative high temperature compatible materials, such as sapphire or graphite (col 11, ln 40-67). Vaudo et al also discloses a multi-zoned hot-wall reactor, where the temperature of the molten metals is independently controlled and temperatures of 1000-1400°C are employed (col 12, ln 1-15).

Vaudo et al teaches the reactor should be made of high temperature compatible materials, such as sapphire or graphite. Vaudo et al does not teach the reactor is made of aluminum nitride.

In a method of using a coated reactor for growing III-V semiconductor films, note entire reference, Razeghi teaches all surface of a growth reaction chamber is coated with a barrier coating capable of withstanding high temperatures and not reacting with reactants and dopants

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utilized at high temperatures and the coating is AlN (col 1, ln 55 to col 2, ln 10). Razeghi also teaches a quartz reaction tube (col 2, ln 20-25) and the AlN coating is deposited using metallo-organic chemical vapor deposition (MOCVD) (col 3, ln 50-67). Razeghi also teaches a stable barrier layer or buffer layer of AlN is formed that passivates the growth environment and prevents any oxygen impurities from reacting in the following deposition (col 3, ln 1-30). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Vaudo et al with Razeghi's AlN coated quartz reactor because AlN is capable of withstanding high temperatures and not reacting with reactants and dopants utilized at high temperatures and AlN prevents oxygen and other impurities from reacting with a growing semiconductor layer (col 1, ln 65 to col 2, ln 5).

Referring to claim 2, the combination of Vaudo et al and Razeghi teach the entire growth reactor and or reactor liner which are employed should be constructed of alternative high temperature compatible materials and AlN is a high temperature compatible material. The combination of Vaudo et al and Razeghi does not teach the entire growth reactor is made of AlN. It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify combination of Vaudo et al and Razeghi by making the whole reactor of AlN because substitution of known equivalents for the same purpose is held to be obvious (MPEP 2144.06).

Referring to claim 3-7, the combination of Vaudo et al and Razeghi teaches a quartz reactor, this reads on applicant's silicon oxide based material, and coating the reactor with AlN using a MOCVD method, this reads on applicant's thermal CVD.

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14. Claims 8-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vaudo et al (US 6,533,874) in view of Razeghi (US 5,599,732) as applied to claims 1-7 above, and further in view of Mayeda (US 5,614,249) or Kim et al (US 5,728,940).

The combination of Vaudo et al and Razeghi teach a double structure reactor ('874 Fig 2), a quartz reactor, gas supply means, and a hot wall reactor, which inherently has heaters. The combination of Vaudo et al and Razeghi does not teach a gas leak detecting means.

In an apparatus for detecting a leak in a chemical vapor deposition, note entire reference, Mayeda teaches a deposition apparatus with a plurality of access channels for a test gas, which allows specific leak testing at selected points in the apparatus (col 2, ln 20-67). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Vaudo et al and Razeghi with Mayeda's leak detection system to prevent damage ('249 col 1, ln 45-67).

In an apparatus for detects leaks in a semiconductor device, note entire reference, Kim et al teaches a leakage gas detector 11 installed in the semiconductor manufacturing device for detecting the leakage of a reaction gas used in a semiconductor device manufacturing process (col 1, ln 1-67). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Vaudo et al and Razeghi with Kim et al's leakage detector to increase the lifespan of the apparatus and prevent explosions (col 1, ln 15-30).

Referring to claims 9-11, the combination of Vaudo et al, Razeghi and Kim et al or the combination of Vaudo et al, Razeghi and Mayeda et al teach all of the structural limitations of claims 9-11. Claims 9-11 also contain method limitations, which are considered intended use and the apparatus taught by the combination of Vaudo et al, Razeghi and Kim et al or the

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combination of Vaudo et al, Razeghi and Mayeda et al would inherently be capable of performing the claimed intended use of the apparatus.

Referring to claim 12-13, the combination of Vaudo et al, Razeghi and Kim et al or the combination of Vaudo et al, Razeghi and Mayeda et al teach AlN.

Conclusion

15. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Kang et al (US 6,197,683) teaches a metal source gas is mixed with a carrier gas such as Ar or N₂ to provide a smooth flow into a deposition chamber (col 6, ln 5-35).

Usui et al (JP 2000-91234) teaches HCl is supplied from an introducing pipe with a carrier gas in a HVPE process (Abstract).

Radhakrishnan (US 5,650,361) teaches an AlN chamber used for the deposition of AlN films (col 4, ln 1-15 and Abstract).

Razeghi et al (US 6,271,104) teaches all surface of a growth reaction chamber are coated with a barrier coating capable of withstanding high temperatures and not reacting with the reactants and the coating is preferably AlN (col 3, ln 15-50).

Molnar (US 6,086,673) teaches a HVPE apparatus, note Fig 1.

Ueda et al (US 6,117,213) teaches a HVPE apparatus using to form AlN (col 3).

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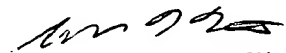
16. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew J Song whose telephone number is 703-305-4953. The examiner can normally be reached on M-F 9:00-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Benjamin L Utech can be reached on 703-308-3868. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

Matthew J Song
Examiner
Art Unit 1765

MJS
May 28, 2003


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